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EXAMINER

CHEN, PO WEI

ART UNIT

PAPER NUMBER

2697

DATE MAILED: 06/19/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/964,125

Applicant(s)

WILLIS, DONALD HENRY

Examiner

Po-Wei (Dennis) Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 12-18 is/are rejected.
- 7) ☒ Claim(s) 10 and 11 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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### DETAILED ACTION

Claims 1-18 are pending in this application. Claims 1 and 13-15 are independent claims. This action is non-final

The present title of the invention is "Reduction of Contouring in Liquid Crystal on Silicon Displays by Dithering".

The Group Art Unit of the Examiner case is now 2697. Please use the proper Art Unit number to help us serve you better.

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baldwin et al. (US 5,986,640; refer to as Baldwin herein) and further in view of McKnight et al. (US 6,373,497; refer to as McKnight herein).

3. Regarding claim 1, Baldwin teaches a display device comprising:

A method of reducing contouring in a display ("dynamic contouring" can be reduced by manipulation of the time division multiplex addressing scheme", see lines 44-46 of column 2);

Applying a first dither to said input signal, said first dither selectively modifying a primary-color gamma value of one of said pictures resulting in reduced contouring in said input signal ("the video signals representing the red, green and blue colour components of the image to be displayed, is applied to an analogue to digital converter (ADC) unit 129 together with a

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synchronizing signal. The output of the ADC unit 129 is applied to a gamma correction unit 131 to remove the gamma correction signal", see lines 12-20 of column 12 and Fig. 14). While the claim recites dither, it is clear that the dither is defined as modifying gamma value, which is disclosed by Baldwin. Thus, limitation of claim is met.

It is noted that Baldwin does not disclose a liquid crystal on silicon (LCOS) and receiving a frame-doubled input signal comprising a positive picture and a negative picture. However, this is known in the art taught by McKnight. McKnight teaches a time sequential lookup table arrangement for a display that "because driving consecutive positive frames may cause liquid crystal malfunctions, liquid crystal display pixels are invariably driven by an alternating voltage having a positive and negative swing" (see lines 18-20 and 43-46 of column 1). While the claim recites frame-doubled and picture, it is clear that by having positive and negative pixels which forms the pictures of frames, provides the same input signals to the display. It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the teaching of McKnight to provide a display with faster performance by using a LCOS. Also, to prevent liquid crystal displays to be malfunction, the signal has a positive and negative swing (see lines 21-23 and 43-46 of column 1, McKnight).

4. Regarding claim 2, Baldwin teaches a display device comprising:

First dither is specified by a gamma table ("The distribution of the input bit weights between the additional display intervals is achieved within the gamma corrector 131 by modifying the look-up table, which is generally incorporated within the gamma corrector, to increase the output bus width", see lines 11-15 of column 13).

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5. Regarding claims 3 and 4, it is noted that Baldwin does not disclose one of said pictures is said negative picture and one of said pictures is said positive picture. However, this is known in the art taught by McKnight. McKnight teaches a time sequential lookup table arrangement for a display that “because driving consecutive positive frames may cause liquid crystal malfunctions, liquid crystal display pixels are invariably driven by an alternating voltage having a positive and negative swing” (see lines 43-50 of column 1).

6. Regarding claim 6, Baldwin teaches a display device comprising:

Primary-color is selected from the group consisting of red, green, and blue (“the video signals representing the red, green and blue colour components of the image to be displayed, is applied to an analogue to digital converter (ADC) unit 129 together with a synchronizing signal. The output of the ADC unit 129 is applied to a gamma correction unit 131 to remove the gamma correction signal”, see lines 12-20 of column 12).

7. Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baldwin et al. (US 5,986,640; refer to as Baldwin herein) and McKnight et al. (US 6,373,497; refer to as McKnight herein) as applied to claim 1 above, and further in view of Wu et al. (US 6,469,708; refer to as Wu herein).

8. Regarding claim 5, it is noted that the combination of Baldwin and McKnight does not disclose the input signal is an 8-bit signal and said output signal is a 10-bit signal. However, this is known in the art taught by Wu. Wu teaches an image dithering device that “After the conversion by Gamma Table 31, the original 8-bit data become 10-bit data”, see lines 21-23 of column 2). It would have been obvious to one of ordinary skill in the art at the time of invention

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to utilize the teaching by Wu to improve image quality (see lines 36-39 of column 1, Wu) and because the other references are directed towards a dither system.

9. Regarding claim 7, Baldwin teaches a display device comprising:

An output signal having reduced brightness level repetition for consecutive input levels (“an array of switchable elements wherein grey scales are at least partially displayed”, see lines 31-41 of column 2 and lines 45-48 of column 4). It is noted that by frame modulation process for switching each display element between “On” and “Off” states, different brightness level can be produced. Thus, limitation of claim is met.

It is noted that the combination of Baldwin and McKnight does not disclose applying a second dither to said input signal. However, this is known in the art taught by Wu. Wu teaches an image dithering device which “dithering technology that combines both time domain and space domain and enhances the Gamma Table so as to improve image quality” (see lines 37-39 of column 1). It is noted that the input signals are being converted using gamma table (first dithering) and also with a dithering matrix which produced a dithering value DV (second dithering) according to the row counting and column counting values (see lines 11-34 of column 2 and Fig. 2).

10. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Baldwin et al. (US 5,986,640; refer to as Baldwin herein) and McKnight et al. (US 6,373,497; refer to as McKnight herein) as applied to claim 1 above, and further in view of Wu et al. (US 6,469,708) and Clark et al. (US 5,398,297; refer to as Clark herein).

11. Regarding claim 8, Baldwin teaches a display device comprising:

First dither is specified by a gamma table (“The distribution of the input bit weights between the additional display intervals is achieved within the gamma corrector 131 by modifying the look-up table, which is generally incorporated within the gamma corrector, to increase the output bus width”, see lines 11-15 of column 13).

It is noted that the combination of Baldwin and McKnight does not disclose a second dither. However, this is known in the art taught by Wu, as statements presented above, with respect to claim 7 are incorporated herein.

Further, it is noted that the combination of Baldwin and McKnight does not disclose dither is applied at an input of said gamma table. However, this is known in the art taught by Clark. Clark teaches a color rendering method based upon a dithering table that “this dithered information, which is preferably in four-bit per pixel format, is then processed through an output transformation step” (see lines 15-27 of column 5 and Fig. 2). It is noted that the data is being dithered and processed through the output transformation step which includes the gamma table. Thus, limitation of claim is met. It would have been obvious to one of ordinary skill in the art to utilize the teaching

12. Claims 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baldwin et al. (US 5,986,640; refer to as Baldwin herein) and McKnight et al. (US 6,373,497; refer to as McKnight herein) as applied to claim 1 above, and further in view of Ishii (US 6,362,834).

13. Regarding claim 9, it is noted that the combination of Baldwin and McKnight does not disclose dither is performed by applying a one-least-significant-bit dither signal to said input signal. However, this is known in the art taught by Ishii. Ishii teaches a display controller with improved dithering which “dither adders each add the received color carry input to a specified bit

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in the color data on lines 410. Adding bit position (the least significant bit of base dither color) is specified by three appropriate bits in register 404" (see lines 51-54 of column 7 and Fig. 6). It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the teaching of Ishii to provide a visually pleasing images without undesirable visual artifacts (see lines 39-40 and 64-67 of column 1 and line 1 of column 2, Ishii).

14. Regarding claim 12, it is noted that the combination of Baldwin and McKnight does not disclose dither is selected from the group consisting of a 2-state dither, a 4-state dither, and an 8-state dither. However, this is known in the art taught by Ishii. Ishii teaches a display controller with improved dithering which "dynamic dithering is programmable to specify, two-phase, four-phase or eight-phase mixes to generate signals" (see lines 7-9 of abstract).

15. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Baldwin et al. (US 5,986,640; refer to as Baldwin herein), and further in view of McKnight et al. (US 6,373,497; refer to as McKnight herein) and Ishii (US 6,362,834).

16. Regarding claim 13, with statements presented above, with respect to claims 1 and 9 are incorporated herein.

17. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Baldwin et al. (US 5,986,640; refer to as Baldwin herein) and further in view of McKnight et al. (US 6,373,497; refer to as McKnight herein) and Wu et al. (US 6,469,708; refer to as Wu herein).

18. Regarding claim 14, with statements presented above, with respect to claims 1 and 7 are incorporated herein.

19. Claims 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baldwin et al. (US 5,986,640; refer to as Baldwin herein) and further in view of McKnight et al. (US



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6,373,497; refer to as McKnight herein), Ishii (US 6,362,834), Wu et al. (US 6,469,708; refer to as Wu herein) and Clark et al. (US 5,398,297; refer to as Clark herein).

20. Regarding claim 15, Baldwin teaches a display device comprising:

A system for reducing contouring in a display (“dynamic contouring” can be reduced by manipulation of the time division multiplex addressing scheme”, see lines 44-46 of column 2);

First dither selectively modifies at least one primary-color gamma value of one of said pictures and gamma table specifying a first dither to apply to a received signal (“the video signals representing the red, green and blue colour components of the image to be displayed, is applied to an analogue to digital converter (ADC) unit 129 together with a synchronizing signal. The output of the ADC unit 129 is applied to a gamma correction unit 131 to remove the gamma correction signal”, see lines 12-20 of column 12 and Fig. 14 and lines 11-15 of column 13);

It is noted that Baldwin does not disclose a memory having a gamma table stored therein and frame-doubled input signal comprising a positive and a negative picture, a liquid crystal on silicon display for producing an image based upon said input signal and generating said gamma table and loading said gamma table in said memory. However, this is known in the art taught by McKnight. McKnight teaches a time sequential lookup table arrangement for a display that “because driving consecutive positive frames may cause liquid crystal malfunctions, liquid crystal display pixels are invariably driven by an alternating voltage having a positive and negative swing” (see lines 18-20 and 43-46 of column 1). McKnight discloses a gamma table stored in a storage device and generating said gamma table and loading said gamma table in said memory (see lines 17-25 of column 2 and lines 41-43 of column 5). It is noted that the gamma

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LUT data corresponding to a subframe of an image to be displayed are generated and sent to the LUT, which is stored in a storage device. Thus, limitation of claim is met.

It is noted that the combination of Baldwin and McKnight does not disclose a processor communicatively linked to said memory and a dither unit and said dither unit applying a second dither comprising a one-least-significant-bit dither signal to the input signal. However, this is known in the art taught by Ishii. Ishii teaches a display controller with improved dithering comprising a processor linked to memory and a dither unit (see lines 57-67 of column 3 and Fig. 4). Also Ishii teaches that "dither adders each add the received color carry input to a specified bit in the color data on lines 410. Adding bit position (the least significant bit of base dither color) is specified by three appropriate bits in register 404" (see lines 51-54 of column 7 and Fig. 6).

Also, it is noted that the combination of Baldwin, McKnight and Ishii does not teach a multiple dithered system. However, this is known in the art taught by Wu, as statements presented above, with respect to claim 7 are incorporated herein.

Further, it is noted that the combination of Baldwin, McKnight, Ishii and Wu does not disclose dither at an input to said gamma table. However, this is known in the art taught by Clark, as statements presented above, with respect to claim 8 are incorporated herein.

21. Regarding claim 16, Baldwin teaches a display device comprising:

An analog-to-digital converter, said analog to digital converter digitizing said input signal (see lines 12-20 of column 12). It is noted that Baldwin does not disclose a processor. However, this is known in the art taught by Ishii, as statements presented above, with respect to claim 15 are incorporated herein.

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22. Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baldwin et al. (US 5,986,640; refer to as Baldwin herein), McKnight et al. (US 6,373,497; refer to as McKnight herein), Ishii (US 6,362,834), Wu et al. (US 6,469,708; refer to as Wu herein) and Clark et al. (US 5,398,297; refer to as Clark herein) and further in view of Akimoto et al. (US 4,364,084; refer to as Akimoto herein).

23. Regarding claims 17 and 18, Baldwin teaches a display device comprising:

Gamma table with dithered values (see lines 11-15 of column 13).

It is noted that Baldwin does not disclose one of said pictures is said negative picture and one of said pictures is said positive picture. However, this is known in the art taught by McKnight, as statements presented above, with respect to claim 1 are incorporated herein.

Further, it is noted that the combination of Baldwin, McKnight, Wu and Ishii does not disclose gamma table has a positive portion and a negative portion. However, this is known in the art taught by Akimoto. Akimoto teaches a color correcting system which "the gamma of the film is different for the negatives from that for the positives, the standard gamma conversion tables should be separated prepared fro the negatives and positives and stored in the computer so that the tables may be selectively used according to the kind of the film" (see lines 9-20 of column 5). It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the teaching of Akimoto to provide a faster processing speed (see lines 29-31 of column 2, Akimoto).

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### *Claim Objections*

24. Claims 10-11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### *Conclusion*

25. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Mikoshiba et al. (US 6,496,194) disclose "Halftone Display Method and Display Apparatus for Reducing Halftone Disturbances Occurring in Moving Image Potions".

Lucas et al. (US 5,664,080) disclose "System and Method for Generating a Universal Palette and Mapping an Original Color Space to the Universal Palette".

### *Inquiry*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Po-Wei (Dennis) Chen whose telephone number is (703) 305-8365. The examiner can normally be reached on 9am-5pm.

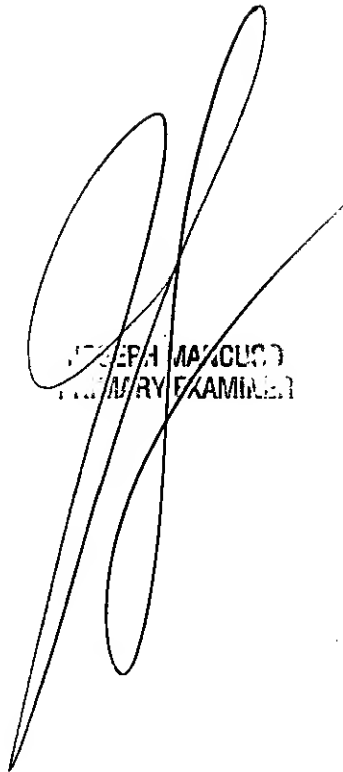
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffrey Hofsass can be reached on (703) 305-4717. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-6743 for regular communications and (703) 308-6743 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

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Po-Wei (Dennis) Chen  
Examiner  
Art Unit 2697

Po-Wei (Dennis) Chen  
June 12, 2003



JOSEPH MANCUSO  
PRIMARY EXAMINER